

REMARKS

This application has been reviewed in light of the Office Action dated August 11, 2005. Claims 1, 2, 4-6, 8, 9-12, 14-18, 20 and 21-26 are presented for examination, of which Claims 1, 2, 11, 12, 25 and 26 are in independent form. Claims 3, 7, 13 and 19 have been canceled, and their recitations incorporated into their respective independent claims; these actions are taken without prejudice or disclaimer of subject matter, and the canceled claims will not be mentioned further. Claims 1, 2, 4, 6, 8, 10-12, 14, 17, 18, 20 and 23-26 have been amended to define still more clearly what Applicants regard as their invention. The abstract has been amended as to a number of minor matters of form, and a substitute specification, in which no new matter has been added, is submitted herewith in both a marked and a clean version.

Initially, Applicants note that an Information Disclosure Statement and a corresponding Form PTO-1449 were filed on January 4, 2002, as evidenced by the attached PAIR printout. Applicant respectfully requests the Examiner to return an initialed copy of the form PTO-1449, to confirm that the documents cited therein have been considered.

The specification was objected to under 35 U.S.C. § 112, first paragraph, as failing to provide enablement for the claimed invention, and Claims 2, 6, 10, 12, 18, 24 and 26 were rejected under Section 112, first paragraph, as not being enabled by the specification as filed.

Applicants note that the recitations of Claims 6, 10, 18 and 24 are clearly supported by the disclosure of page 40, line 25 to page 41, line 1, of the originally filed specification, and it is understood that the rejection of these claims under Section 112 is based solely on the question of enablement. Applicants respectfully point out that the use

of anion dyes and of cation dyes in printing liquids is well known. U.S. Patents 6,024,431 (Takahashi et al.) and 6,024,674 (Inui et al.), both assigned in common with the present application, provide examples before the priority date of this application, of the use of cation and anion dyes in printing liquids (inks) in ink-jet printing. *Inui*, in particular, contains fairly extensive discussion of the use of a combination of anion and cation dyes in order to induce a reaction between them upon printing, to cause the anion and the cation to combine with each other to form an insoluble reaction product, thus stabilizing the position of the pigment on the recording medium and in this way to keep the ink from running and blurring.

Moreover, Applicants submit that the claims in question merely recite that dyes of certain types are used. Assuming that dyes of those types, and of the specified colors, are commercially available, all that is required to practice the portion of the invention recited in these claims is to obtain dyes of the specified types and colors, to mix them with appropriate solvents and to place them in the ink reservoirs for use. Examples of ink mixtures using such solvents, etc., are present in the specification, as well as in the mentioned *Inui* patent. It is noted that these claims do not specify any particular effect to be obtained by the use of the recited types of dyes, only that they are used, and thus nothing more needs to be enabled in this regard, for these claims to be enabled.

Accordingly, withdrawal of the rejection of these claims, and of the related objection to the specification, under Section 112, first paragraph, is respectfully requested.

With regard to the rejection of Claims 2, 12 and 26 for non-enablement, Applicants note that the Examiner's understanding that *n* and *m* correspond to different levels of quantization, is correct. The application as filed states, at page 23, lines 1-4:

“If a printer has a function of changing the size and density of ink dots by two steps or more, the multi-valued processing method suitable for this printer may be used without limiting only to the binarizing method.”

From this, it is clear that n may have a value other than 2, and that the present invention is contemplated as encompassing a case in which the value n is different from 2. Applicants point out that multi-level ink-jet printing, in itself, is well known, and submit that the application of the present invention to a case where there are four, eight or more available output levels is straightforward. Accordingly, withdrawal of the rejection of these claims under Section 112, first paragraph, also is respectfully requested.

Claims 1, 2, 11, 12, 25 and 26 were rejected as being indefinite because of the use of the terms “higher” and “secondary” (see page 4 of the Office Action). As kindly suggested by the Examiner, Applicants have incorporated the recitations of Claims 3, 7, 13 and 19 into these claims. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 1, 4, 5, 11, 14, 15 and 25 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,917,994 (Perumal et al.), and Claims 2, 7-9, 12, 20-23 and 26, as being anticipated by U.S. Patent 5,982,993 (Slade).

In addition, Claims 6 and 18 were rejected under 35 U.S.C. § 103(a) as being obvious from *Perumal* in view of U.S. Patent 5,882,390 (Nagai et al.), Claims 16 and 17, as being obvious from *Perumal* in view of U.S. Patent 6,616,257 (Imanaka), and Claims 10 and 24, as being obvious from *Slade* in view of *Nagai*.¹

^{1/} It is noted that the Examiner has not made *Imanaka* of record; accordingly, it is respectfully requested that the Examiner list it on a form PTO-892 in his next paper.

As is described in greater detail in the present application, low-density areas in images produced by means of ink-jet printing may suffer from an undesirable grainy, or granular, appearance, caused by the clustering of dots of ink. Such clustering is an artefact of the printing method, and as such, gives the affected area an appearance quite different from the original image. Techniques for mitigating this problem in monochrome images have been known for some time, but the application of these techniques to color printing in a straightforward way does not produce the same results that are obtained in monochrome printing. The reason for this is that conventional anti-clustering techniques are reasonably easy to apply to the various color components of a color image separately, but this often fails to prevent clustering of dots of several colors together, which can still give the printed image an undesirable appearance.

The present invention addresses the problem of granularity in low-density portions of a color ink-jet image, by replacing, at least partially, the data that would ordinarily be printed using either or both of two (or more) specified colors, from among the color components of the image data being used for the printing. What is printed in lieu of the replaced print data is ink of a secondary color. For example, if magenta and yellow are the two specified color components, then blue can be used as the secondary color.

Moreover, the present invention uses, as the secondary color printing material (ink, etc.) one whose lightness is higher than that of the coloring materials of the two specified colors. This prevents the use of the secondary color from unintentionally introducing another source of granularity, namely, the dots of the secondary color itself.

Independent Claim 1 is directed to an image processing method of generating print data for a plurality of different color materials to be used by a printer.

That method comprises steps of generating secondary-color print data, and of using that print data to replace, at least partially, certain portions of the original print data. More specifically, the print data of a secondary color is generated by using print data of predetermined set of two or more color hues from among the plurality of colors of print data. (For example, the predetermined set of colors may be the set consisting of magenta and yellow, and the secondary color may be blue, as in several of the preferred embodiments; the scope of the claims, of course, is not limited by the details of those embodiments.) Then, there is generated processed print data, in which original print data of the predetermined two hues is replaced at least partially with the print data of the secondary mixture color. According to Claim 1, the color material for generating the print data of the secondary color has a higher lightness than do the color materials for generating the print data of the predetermined two hues.

Thus, among other notable features of the method of Claim 1, in addition to the at least partial replacement of at least some of the print data of two specified color components with a secondary color ink, is the feature that the color material of the latter ink has a higher lightness than do the color materials used for printing the print data of those two specified color components.

Perumal relates to color a digital halftoning system for use with a color printer capable of printing in any of eight inks (red, blue, green, cyan, magenta, yellow, black and white; respectively, R, B, G, C, M, Y, K and W). To improve the appearance of color prints by making them approximate the smoothness of continuous-tone images without having to use very slow or very expensive processing, the *Perumal* system first processes the image data by converting the input data from the RGB color system to the

hue-plus-gray (“HPG”) system, in which each pixel is represented by four components, W, K, one from among C, M and Y (“p”), and one from among R, G and B (“s”). The four components must total 255. This four-component vector is then further processed by reducing the amount of black (K ink) in a pixel, and by increasing the amounts to be used of C, M and Y inks. In addition, the amount of W is reduced, and ink of one color from among R, G and B is used. The three inks C, M and Y are each increased by the amount as that by which K is reduced, (that is, $\delta C = \delta M = \delta Y = \delta K$).² To ensure that the total of the components remains 255, the amount of W is reduced by $2\delta K$. If there is not enough W in the image data to permit this, then K is reduced, and C, M and Y are increased, by a smaller amount, consistent with the value of W in the data. Moreover, if afterwards W is still non-zero, then the amount s (the one component from among R, G and B) is reduced, with equal increases to two of the components C, M and Y. Again, to maintain the total of the components equal to 255, W is reduced by an amount equal to the reduction in s. If the remaining value of W is not large enough to permit this, then the reduction to s is made sufficiently small to meet the requirements $\delta s = \delta W = \delta P_1 = \delta P_2$ (where P1 and P2 are the colors from among C, M and Y that can be used to form the color represented by s).

Applicants submit, however, that nothing has been found, or pointed out, in *Perumal* that would teach or suggest the recitation of Claim 1 that in a case of generating print data of a secondary color (here, R, B or G) by using print data of a predetermined pair of color hues (from among C, M and Y, in the preferred embodiments), the lightness of the color material for the secondary color is higher than the lightness of the color materials for

^{2/} This equation relates, of course, the absolute values, not the algebraic values, of the changes in the components in question.

the predetermined two hues. As described above, however, this feature has the merit of further improving the reduction in granularity achieved by the present invention.

For at least this reason, Claim 1 is believed to be clearly allowable over *Perumal*.

Independent Claims 11 and 25 are method and computer memory medium claims, respectively, corresponding to apparatus Claim 1, and are believed to be patentable for at least the same reasons as discussed above in connection with Claim 1.

Independent Claim 2 is directed to an image processing method of generating print data for a plurality of different color materials to be used by a printer, based on data to be printed. In the method of Claim 2, n-value print data of a secondary color is generated for a predetermined pair of color hues from among the plurality of colors of print data, based on m-value data to be printed, where $m > n$, and with m and n both being integers. The generated n-value print data of the secondary color is caused to correspond to the m-value data, and n-value print data is generated for the predetermined two color hues based on data obtained by subtracting the corresponding m-value data of the secondary color from the m-value data for the predetermined two color hues. Also, according to Claim 2, the color material for generating the print data of the secondary color has a higher lightness than do the color materials for generating the print data of the predetermined two hues.

Slade relates to a technique of printing in which are used, not only inks of four colors (CMYK), but two cyan inks, of different saturations or intensities, and two magenta inks, of different intensities. Some fraction of the regular magenta ink may be

replaced with the lighter-intensity magenta ink, and similarly for the regular cyan ink. The fractions so replaced need not be the same for both colors (col. 6, lines 4-17).

Nonetheless, Applicants submit that nothing has been found, or pointed out, in *Slade* that would teach or suggest replacing some portion of primary-color inks with an amount of a secondary-color ink, much less that the colorant of such secondary-color ink should have a higher lightness than do the colorants of the replaced inks, as is recited in Claim 2. For at least these reasons, Claim 2 is believed to be clearly allowable over *Slade*.

Independent Claims 12 and 26 are method and computer memory medium claims, respectively, corresponding to apparatus Claim 2, and are believed to be patentable for at least the same reasons as discussed above in connection with Claim 2.

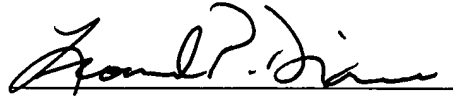
A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and allowance of the present application.

Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

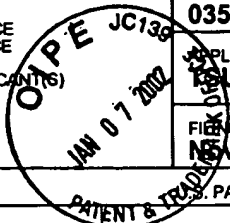
Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Leonard P. Diana", written over a horizontal line.

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FORM PTO 1449 (modified) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE LIST OF REFERENCES CITED BY APPLICANT(S) (Use several sheets if necessary)			ATTY DOCKET NO. 03500.015944.		APPLICATION NO. 09/987,530		RECEIVED JAN 10 2002 Technology Center 211			
			APPLICANT TSUYOSHI SHIBATA ET AL.			FILING DATE November 15, 2001			GROUP 2176	
			PATENT DOCUMENTS							
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE			
		4,459,600	07/10/84	Sato et al.	346	140				
		4,558,333	12/10/85	Sugitani et al.	346	140				
		4,313,124	01/26/82	Hara	346	140				
		4,345,262	08/17/82	Shirato et al.	346	140				
		4,463,359	07/31/84	Ayata et al.	346	1.1				
		4,740,796	04/26/88	Endo et al.	346	1.1				
		4,723,129	02/02/88	Endo et al.	346	140				
FOREIGN PATENT DOCUMENTS										
		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES/NO/ OR ABSTRACT			
	JP	59-138461	08/08/84	Hara et al.			Abstract			
	JP	59-123670	07/17/84	Aoki et al.			Abstract			
OTHER DOCUMENT(S) (Including Author, Title, Date, Pertinent Pages, Etc.)										
EXAMINER					DATE CONSIDERED					

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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